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RECENT LITERATURE.

Iowa Geological Survey.[1]— The first annual report of the Iowa Geological Survey just issued is unusually attractive in appearance, and presents an interesting array of papers. That by Professor Calvin deals with some phases, of the, as yet, imperfectly known Cretaceous deposits occurring in Woodbury and Plymouth counties, and contributes important information concerning them. These deposits in the area studied consist of soft sandstone interstratified with bands of ferruginous nodules and variegated, often parti-colored, clays, overlaid by white, or yellowish chalk, in part indurated into beds of soft fissile limestone. White, in his report of 1870, termed this chalk the Inoceramus bed, from the great numbers of *Inoceramus problematicus* found in it, while the lower beds were called the Woodbury sandstone and shales. Professor Calvin, mainly on paleontological evidence, separates the latter into two divisions, the lower of which, chiefly sandstones containing impressions of leaves belonging to species of plants resembling our modern forest trees and with animal remains exceedingly scarce, he correlates with the Dakota group of Meek and Hayden. The second division, principally shales containing impressions of valves of marine molluscs associated with the vertebræ of bony fishes and the skeletons of marine saurians, is the Fort Benton group of the same authors, while the chalk represents their Niobrara group. The few molluscan remains found in the beds of the Dakota group are related to brackish water species and imply that the beds were laid down in an estuary, or at least in a region where the sea was shallow and large volumes of fresh water were poured into it.

The beds of the second division show a gradual change in the conditions of deposition owing to the deepening of the sea and the shifting of shore line farther east. True marine molluscs, and fishes and reptiles occupied the region, and left their skeletons to be buried in the finer mud that characterized the deposits then slowly accumulating in the open sea.

During the succeeding epoch where the chalk and shell-bearing limestones were forming, the water, by subsidence of the ocean bed, had become deeper, and the shore-line of the Cretaceous sea attained its farthest extension eastward probably reaching as far as the Mississippi in northwestern Iowa. Inoceramus multiplied over the sea bottom as oysters, if undisturbed, would crowd a modern oyster bed. Sharks disputed possession with the bony fishes and marine saurians. Everything betokens a deep, clear, open sea that spread away from the shore line in Iowa, over all the intervening plain, to the present site of the Rocky Mountains. Recent excavations and cuttings have shed much light on the Iowa Cretaceous and the present survey which will doubtless add much to our knowledge of this important group of rocks. There are two formations in Iowa, probably belonging to the Cretaceous, whose exact stratigraphical relations are at present doubtful, viz.; the Fort Dodge gypsum deposits and the Nishuabrtua sandstone.

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[1] First Annual Report for 1892, with Accompanying Papers. 8vo. 472 pp. with ten plates and twenty-six figures. Samuel Calvin, State Geologist, Des Moines, 1893.

The assistant state geologist, C. R. Keyes, contributes several papers the most important of which is on the classification of the Iowa formations. While in large part merely a summary of the work done upon these rocks in recent years by various workers, it also presents someimportant considerations derived from the author's personal investigations In the revision of the classification, some needed changes in nomenclature appear, as St. Croix for Potsdam, Oneota for Lower Magnesian, etc. The attempt to correlate the Iowa rocks with the New York section is wisely abandoned. In the classification of the Lower Carboniferous, the formations included between the Kinderhook below and the St. Louis beds above are grouped together under the term Augusta. These beds comprise what Williams[2] called the Osage group, a name here shown to be inapplicable.

It is in his discussion of the Coal Measures, however, that the author departs most widely from the generally accepted views of Iowa geology. After some general considerations of the Coal Measure deposits, he calls attention to the two classes of sediments generally recognized, viz.; marginal or shore deposits, and those laid down in the open sea. In the Coal measures, as elsewhere, the first of these is characterized by rocks predominantly clay, shales and sandstones with practically no limestones. The sandstones often form great lenticular masses, sometimes deeply channelled on the upper surface, the excavations being filled with Coal Measure clays. These and many other phenomena attest a constantly shifting shore line and the shallow waters. The fossils are nearly all brackish water forms or shore species. On the other hand, the second class of deposits above mentioned is made up largely of calcareous shales with heavy beds of limestone. The former are chiefly composed of strictly open sea forms.

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[2] H. S. Williams, Bul. U. S. Geol. Surv., No. 80, p. 109.

As the conditions of deposition were evidently those of a slowly sinking sea shore, the marginal deposits or Lower Coal Measures practically underlie the open sea formations or the Upper Coal Measures. Hence in the use of the terms Lower and Upper, though allowable in a general way, it must be remembered that along any particular plane the two series of deposits are contemporaneous and their separation therefore would be represented by an oblique rather than a horizontal plane. Under this view the author proposes to divide the Coal Measures or Pennsylvanian series into (1) the Des Moines stage, representing the marginal deposits, thus including all the coal, and (2) the Missouri stage representing the marine deposits. These correspond essentially with the Lower and Upper Coal Measures as ordinarily given. The coal seams are shown to have but a limited extent generally, and to be nearly worthless for correlation purposes. The seams vary from a few inches to seven or eight, and even ten feet in thickness, the average of the seams now worked being between four and five feet. They are not disposed in continuous layers over the whole area as commonly supposed, but in numerous lenticular masses from a few yards to several miles in extent. Being confined to the marginal areas they are associated principally with the sediments characterizing that class of deposits, and have a slight seaward slope. They were laid down over an ancient eroded surface with hills and vales, ridges and gorges, and overlap Lower Carboniferous, Devonian, and even Silurian rocks. The paper is illustrated with numerous figures and diagrams showing graphically the structure of the Iowa coal field, and the essential differences between the views here advanced and those commonly held.

Other papers of value are presented by S. W. Beyer, H. F. Barie and G. L. Houser. That of Mr. Beyer treats of an interesting discovery of eruptive rock in a deep well at Hull, Iowa, at a depth of seven hundred and fifty-five feet, interstratified with beds of sandstone constituting what was considered to be Sioux Quartzite.

Additional facts bearing upon this occurrence of eruptive rocks in Iowa will be looked for with interest.

As a whole the report shows marked wideness of taste and care in its makeup, though the proof reader evidently mislaid his glasses at certain points, or was it the typo who failed to note the corrections?

C. H. G.

Correlation Papers—The Newark System.[3]—This essay, prepared by Mr. I. C. Russell as a bulletin, is the sixth of the series of

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[3] Bulletin of the United States Geological Survey, No. 85. Correlation Papers—The Newark System. By I. C. Russell, Washington, 1892.